REMARKS

Claims 1-47 have been examined and stand rejected. By the above amendments, claims 1, 10, 21, 27, 41, and 47 have been amended, and new claims 48-55 have been added. Accordingly, claims 1-55 now are pending in the subject application. Favorable reconsideration of the application and allowance of all of the pending claims are respectfully requested in view of the above amendments and the following remarks.

The drawings are objected on the basis that the plurality of optical sources, modulators, and etalons recited in claims 18 and 19 are not explicitly shown in the figures. Applicant submits herewith a replacement sheet containing amended Fig. 1 in which the optional optical sources, modulators, and etalons are shown with dashed lines. Support for these features is found in Applicant's specification at least on page 8, line 32 – page 9, line 3.

Claim 10 stands rejected under 35 U.S.C. §112, first paragraph, as failing to comply with the written description requirement. Specifically, the meaning of the term "LiNiBO" is questioned. By way of clarification, the designation "LiNiBO" refers to the well-known substance lithium niobate, which is commonly used in electro-optical phase modulators. It appears that the designation for lithium niobate generally includes the numeral "3" at the end, which was inadvertently omitted from the designation used in the specification (page 5, line 6) and claim 10. Nevertheless, one skilled in the art would readily recognize from use of this designation in this context that Applicant is referring to lithium niobate. For clarity, Applicant has amended the specification and claim 10 to also refer to lithium niobate. Accordingly, the Examiner is respectfully requested to reconsider and withdraw this rejection.

Claims 1-4, 9, 11, 13, 14, 16, 20-30, 35, 36, 38, and 40-47 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Piehler et al. (U.S. Patent No. 5,940,196) in view of Turner III (U.S. Patent Application No. 2004/0042083). Further, claims 5, 6, 8, 12, 15, 31, 32, 34, 37 are rejected over Piehler, Turner III, and Lauder et al. (U.S. Patent No. 2002/0109896), claims 7 and 33 are rejected over Piehler, Turner III, and May (U.S. Patent No. 2002/0041611), claims 17 and 39 are rejected over Piehler, Turner III, and Schmitz et al. (U.S. Patent No. 2002/0088922),

and claims 18 and 19 are rejected over Piehler, Turner III, and Aso et al. (U.S. Patent No. 2003/0048503). Applicant respectfully traverses these rejections for the following reasons.

Applicant's claims are directed to photonic channelized receivers and related methods for detecting the frequency of an RF signal. Piehler relates to an optical communication system for conveying RF signals over long distances using optical signals. As will be appreciated from the following explanation, there are requirements of Applicant's claims which clearly distinguish the claimed invention from an optical communication system such as Piehler's, and there are no obvious modifications that could be made to such an optical communication system to conform to the requirements of Applicant's claims.

Claim 1 sets forth a receiver that includes, *inter alia*, an optical source that produces a plurality of optical signals at respective, spaced wavelengths, an optical combiner that combines the optical signals into a common beam, and an electro-optical modulator that modulates the common beam with an RF signal to produce sidebands offset from frequencies of the plurality of optical signals by the frequency of the RF signal. As is evident from the plain wording of the claim, these components <u>are part of the receiver</u>. This fact is also evident from reviewing Fig. 1 and Applicant's disclosure. Unlike an optical communication system, these components are used in Applicant's <u>receiver</u> to create a set of channels which allow the receiver to determine the frequency of a received RF signal. To further clarify this point, claim 1 has been amended to explicitly recite that the optical source, the optical combiner, and the electro-optical modulator are <u>of the receiver</u>, as plainly shown in Fig. 1 and described in Applicant's specification. Independent receiver claims 21 and 27, which also require at least an optical source and combiner, have been similarly amended.

Piehler does not disclose or even remotely suggest any receiver that includes any of these claimed components. The Examiner relies on communication system shown in Fig. 5 of Piehler, equating Piehler's sources 70, 72, WDM 80, and modulator 86 with the claimed sources, combiner, and modulator, respectively. However, as clearly explained at column 6, lines 33 – 57 of Piehler, these components are not part of any receiver. Rather, these components are part of the transmitter of the optical communication system which transmits an RF-modulated signal

over a distance (represented in Fig. 5 by fiber optical span 90) to a distant receiver. This difference is not surprising, since Piehler relates is an optical communication system which inherently involves both a transmitter at one location and a receiver at another location. In contrast, all of the elements of claims 1, 21, and 27 are part of a receiver. Moreover, there is no obvious modification that could be made to Piehler's system that would include putting all of the components of Piehler's transmitter into Piehler's receiver, since the system then could not operate as a communication system.

The fact that Piehler's optical communication system is very unlike Applicant's receiver is evident from other limitations found in each of Applicant's independent claims. For example, claim 1 further requires: an etalon having a periodic transfer function that filters the modulated common beam such that the optical signals in the filtered, modulated common beam function as receiver channels <u>corresponding to respective RF frequencies</u>; a wavelength splitter configured to separate the filtered, modulated common beam into a plurality of channel output signals <u>whose intensities are a function of the frequency of the RF signal</u>; and a plurality of detectors that respectively measure the intensities of the channel output signals <u>to indicate the frequency of the RF signal</u>. Each of independent claims 21, 27, 41, and 47 contains similar limitations.

To appreciate that Piehler does not suggest any of these claim requirements and that there is no obvious modification that could have been made to Piehler to meet these requirements, one must understand the purpose and operation of Piehler's system. The principle of Piehler's system is explained at column 2, lines 11-41; column 3, line 50 - column 4, line 56; and column 6, lines 43-57. Essentially, by transmitting the same RF signal over two optical channels and then combining the received RF signals on the receiver end, the carrier-to-noise ratio is increased. The same RF signal is modulated onto two separate optical carrier wavelengths λ_1 and λ_2 and transmitted over an optical fiber to a distant receiver 56. Photodiodes 104 and 108 are sensitive to signals at wavelengths λ_1 and λ_2, respectively, and each outputs the same RF signal, which are then combined via RF combiner 110 to achieve the improved noise rejection.

With this understanding in mind, it is evident that Piehler's two optical wavelength channels <u>do not correspond to different RF frequencies</u> as required by Applicant's claims.

Rather, Piehler's channels correspond to two different optical wavelengths λ_1 and λ_2,, but the very same RF frequency. Moreover, the signals output by Piehler's photodiodes do not have intensities that are a function of the frequency of the RF signal, as required by Applicant's claims. Again, the point of Piehler's system is that RF signals of the same frequency are generated by all the photodiodes so that the RF signals can be combined. The intensity of the signals from one of Piehler's photodiodes relative to another does not vary as a function of the frequency of the RF signal: both channels are carrying an RF signal of the same frequency. In contrast, in the claimed receiver and method, since the various channels correspond to different RF frequencies, the intensity of the channel output signal generated by a particular channel depends on the frequency of the RF signal (i.e., the channel that matches the frequency of the RF signal will have a greater intensity).

Finally, Piehler's photodiodes do not respectively measure the intensities of channel output signals to indicate the frequency of the RF signal, as required by each of Applicant's claims. Piehler's photodiodes merely generate an RF signal from the modulated optical signal. There is no suggestion in Piehler that these photodiodes measure the frequency of the RF signal or provide any indication of the frequency. In Piehler's communication system, the frequency of the RF signal is set in the transmitter and known to the receiver. There is simply no need to determine the frequency of the RF signal in Piehler's system, and in any event Piehler does not disclose or suggest any mechanism for determining or indicating the frequency of the RF signal.

As the Examiner acknowledges, Piehler lacks the claimed etalon. Claim 1, for example, requires an etalon having a periodic transfer function that filters the modulated common beam such that the optical signals in the filtered, modulated common beam function as receiver channels corresponding to respective, different RF frequencies. In other words, the optical channels of the receiver operate as a bank of RF filters, with each channel responding to a different RF frequency. Applicant's other independent claims recite comparable filtering mechanisms or operations.

The Examiner argues that it would have been obvious to incorporate Turner's etalon into Piehler's optical communication system; however, this argument fails to appreciate the filtering

operation of the claimed etalon as well as the different nature and purpose of Piehler's system. In Applicant's claimed system, the etalon has a periodic transfer function which, in conjunction with the wavelength spacing between the optical wavelengths has a filtering effect which results in the optical signals in the filtered, modulated common beam functioning as receiver channels <u>corresponding to respective different RF frequencies</u>. In other words, by operation of the etalon, the plurality of optical channels correspond to respective different RF frequencies. This is due to the fact that the period of the etalon differs slightly from the wavelength spacing between the optical channels (as explicitly recited in certain of Applicant's dependent claims).

It certainly could not have been obvious to modify Piehler's optical communication system such that the optical signals at wavelengths λ_1 and λ_2, would have been filtered by an etalon such that these optical signals would have corresponded to respective RF frequencies. The whole point of Piehler's communication system is to recover the <u>same RF signal</u> transmitted over two optical channels. If claimed etalon filtering were added to Piehler's system, the desired RF signal would be filtered out of all but one channel, i.e., all but the channel that corresponds to the frequency of the RF signal. This, of course, is contrary to the purpose of Piehler's system, which attempts to improve the carrier-to-noise ratio of the RF signal by passing the RF signal through plural channels. Such a filtering mechanism would have no purpose in Piehler's system and would prevent Piehler's communication system from operating in its intended manner. Thus, it would not have been obvious to incorporate Turner's etalon into Piehler's optical communication system in any manner that would meet the requirements of Applicant's claims.

With regard to the rejections that further rely on Lauder, May, Schmitz, and Aso, these documents are cited for alleged teachings of subject matter in certain of Applicant's dependent claims, but like Piehler and Turner, fail to disclose or suggest the elements and limitations of Applicant's independent claims described above. Accordingly, no combination of these documents would have rendered obvious the subject matter of Applicant's claims, and the Examiner is respectfully requested to reconsider and withdraw these rejections.

New claims 48-55 have been added. Claims 48 (48/1), 50 (50/21), 52 (52/27), 53 (53/41), and 54 (54/47) require that the channel output signals not be combined. This is clearly

shown in Fig. 1 and described in the specification on page 6, lines 27-31. Claims 49 (49/1) and 51 (51/27) require that the plurality of detectors correspond to different RF frequencies and that the photonic channelized receiver compare intensities of the channel output signals of the detectors to determine the frequency of the RF signal. Support is found for these claims in Applicant's specification at least on page 8, lines 6-25. Claim 55 (55/1) requires the receiver to include an RF antenna for receiving the RF signal (see Fig. 1). These claims are patentable at least by virtue of their dependence on their parent claims for the reasons explained above.

In view of the foregoing, Applicant respectfully requests the Examiner to find the application to be in condition for allowance with claims 1-55. However, if for any reason the Examiner feels that the application is not now in condition for allowance, the Examiner is respectfully requested to call the undersigned attorney to discuss any unresolved issues and to expedite the disposition of the application.

Filed concurrently herewith is a Petition (with payment) for an Extension of Time of One Month. Also submitted herewith is an excess claim fee in the amount of $400 for payment of eight (8) claims in excess of the 47 total claims previously paid for. Applicant hereby petitions for any extension of time that may be necessary to maintain the pendency of this application. The Commissioner is hereby authorized to charge payment of any additional fees required for the above-identified application or credit any overpayment to Deposit Account No. 05-0460.

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